REMARKS

Claims 12, 16, 18, 20, 22, 24, 26, 28, and 30 are pending in this application. By this Amendment, claims 12 and 16 are amended, and claims 13–15, 17, 19, 21, 23, 25, 27, 29, and 31 are canceled. Support for the amendments to the claims can be found, for example, in the claims as originally filed. No new matter is added.

Applicants thank the Examiner for the indication that claims 18, 20, and 22 contain allowable subject matter.

In view of the foregoing amendments and following remarks, reconsideration and allowance are respectfully requested.

I. Rejections Under 35 U.S.C. §103

The Office Action rejects claims 12–17 and 24–31 under 35 U.S.C. §103(a) over U.S. Patent No. 6,913,646 B2 to Sakurada et al. ("Sakurada") in view of U.S. Patent No. 6,592,662 B2 to Fusegawa et al. ("Fusegawa"). Applicants respectfully traverse the rejection.

Without conceding the propriety of the rejections, independent claim 12 is amended to more clearly recite various novel features of the claimed invention, with particular attention to the Examiner's comments. Specifically, independent claim 12 is amended to incorporate the subject matter of claims 13–15.

The Office Action correctly recognizes that Sakurada does not disclose that a margin of a pulling rate always satisfies a relational formula "the margin of the pulling rate ≥ 0.35 x $\exp(-0.016$ x a diameter of a straight body of the single crystal [mm]) + 0.01." The Office Action also concedes that Sakurada does not disclose that the pulling condition to be changed is at least any one of:

  a) a distance (L1) between a melt surface of the raw material melt and a heat insulating member provided in the chamber,

  b) a position of a heater heating the raw material melt, and

  c) a flow rate (F) of an inert-gas introduced into the chamber

in a direction of the crystal growth axis during pulling the single crystal. The Office Action asserts that Fusegawa cures these deficiencies. Applicants respectfully disagree.

Fusegawa is directed to a CZ method of manufacturing a silicon single crystal, where the levels of variation of interstitial oxygen concentrations are suppressed by controlling the flowrate of an inert gas to match with a certain pulling rate of the crystal. Despite its alleged teachings, Fusegawa does not teach or suggest that the margin of the pulling rate ≥ 0.35 x exp(-0.016 x a diameter of a straight body of the single crystal [mm]) + 0.01.

The Office Action asserts that it would have been obvious to optimize the process parameters taught by Sakurada by the similar process parameters allegedly taught by Fusegawa. However, neither Sakurdara nor Fusegawa teach or suggest a margin of pulling rate parameter as required by claim 12. Furthermore, Fusegawa does not teach or suggest that adjusting the flow of inert gas has anything to do with producing a whole plane in a radial direction that is a defect-free region in a silicon single crystal. Instead, Fusegawa is concerned with controlling the variation in the levels of interstitial oxygen concentrations in the crystal. Therefore, there exists no motivation to combine the two references. One skilled in the art simply cannot obtain the method of claim 12 through the guidance of Sakudara and Fusegawa.

Claim 12 would not have been rendered obvious by Sakurada and Fusegawa. Claims 16, 18, 20, 22, 24, 26, 28, and 30 variously depend from claim 12 and, thus, also would not have been rendered obvious by Sakurada and Fusegawa. Accordingly, reconsideration and withdrawal of the rejection are respectfully requested.

II.   Conclusion

In view of the foregoing, it is respectfully submitted that this application is in condition for allowance. Favorable reconsideration and prompt allowance of claims 12, 16, 18, 20, 22, 24, 26, 28, and 30 are earnestly solicited.

Should the Examiner believe that anything further would be desirable in order to place this application in even better condition for allowance, the Examiner is invited to contact the undersigned at the telephone number set forth below.

Respectfully submitted,

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